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NORTHUMBERLAND & DURHAM  
MEDICAL SOCIETY.

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MARCH 10, 1881.

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# NORTHUMBERLAND AND DURHAM MEDICAL SOCIETY.

THE SIXTH MONTHLY MEETING was held in the Library of the Newcastle-on-Tyne Infirmary, on Thursday, March 10th, 1881,—the President (Dr. Eastwood) in the chair.

The following gentlemen were elected members of the Society:—

Mark A. Wardle, L.R.C.P. & S. Edin., Bishop Auckland.

Robert Purdie, M.B. C.M. Edin., Gateshead.

The following gentleman was proposed for election:—

James Rutherford Morison, M.B., F.R.C.S. Edin., Hartlepool.

## PREVALENT DISEASES OF THE DISTRICT.

Mr. HENRY E. ARMSTRONG presented the following:—

*Return of Admissions to the Newcastle Fever Hospital during the month of February, 1881.*

	Cases.	Deaths.
Enteric Fever ... ..	5	0
Pneumonia . . . . .	1	0
	<hr/> 6	<hr/> 0

The case of Pneumonia is that of the wife of the man who died in hospital from Typhus, in January. She was removed as a suspected case of the same disease, but proved to be one of pneumonia only.

## ON THE GEOLOGICAL DISTRIBUTION OF ENDEMIC GOITRE IN ENGLAND.

By G. A. LEBOUR, M.A., F.G.S., Professor of Geology in the University of Durham College of Physical Science, Newcastle-on-Tyne.

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### 1.—INTRODUCTION.

The object of the present paper is twofold: first, to lay before the Society such facts relating to the geological distribution of endemic goitre as the writer has been able to gather during an investigation which has now lasted more than ten years; and secondly, to invite the assistance and co-operation of those medical men who have special opportunities for obtaining knowledge respecting goitrous



districts. Without aid of this kind this paper could not have been written, even in its present imperfect state ; but it will require much more information before the evidence can be regarded as complete. Among those gentlemen who have most kindly assisted me, I take leave to specially mention Dr. R. Bruce Low, of Helmsley ; Dr. George Savage, formerly of Alston, and now of Bethlehem Hospital, London ; Dr. Robertson, of Otterburn ; Dr. F. Richardson, of Harbottle ; Dr. Morell Mackenzie, London ; the late Sir Richard Griffith, of Dublin ; Mr. Wm. Topley, F.G.S., and other officers of H.M. Geological Survey ; Dr. Buchanan, of the Board of Health ; and the late Dr. Charlton, of Newcastle.

## 2.—AVAILABLE STATISTICS.

Much of the difficulty attending an enquiry of this sort comes from the want, in this country, of authoritative statistics relating to any but fatal diseases. In most foreign countries the case is different. In France, for instance, every male of twenty or twenty-one is examined by a medical council, and pronounced either fit or unfit for military service ; and goitre being one of the accepted causes of exemption, its presence is, of course, carefully noted in every case. The military register combines within its pages almost all the information requisite for a thorough examination of the distribution of the disease among the male population of the country—place of birth, place of residence, age, &c. If similar official returns as to the female population could be obtained, the case would be complete. This, however, can nowhere be got, and it is the more to be regretted since, wherever goitre occurs, it is markedly more prevalent among women than among men.

The whole of the evidence thus supplied by the French registers was sifted and carefully weighed in 1848 by a Commission appointed by the Sardinian Government ; and more recently (in 1867), Dr. de St. Lager, of Lyons, has published a work containing a mass of information derived from similar sources—being, in fact, a recapitulation of all that had been done before on the subject.

With such an excellent body of facts for France, compared with such scanty numerical information as regards England, it appeared to the writer that a statement of the geological results arrived at in the former country would best preface and throw light upon the incomplete set of facts of the same kind which alone it is in his power to bring forward at present for our own country.

## 3.—DISTRIBUTION OF GOITRE IN FRANCE.

The goitriferous and non-goitriferous rocks of France, as ascertained by means of the above-mentioned authorities,\* will be best understood by the following tabular statement :—

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\* Dr. de Saint-Lager "*Etudes sur les causes du crétinisme et du goitre endémique.*"—8vo., Paris, 1867.



GOITRE IS ENDEMIC ON :		GOITRE IS NOT ENDEMIC ON :	
RECENT ...	.....	Alluvial deposits.	
GLACIAL ...	.....	Drift deposits.	
PLIOCENE ...	.....	Pliocene deposits generally.	
MIOCENE....	{ .....	The fahluns of Touraine, Gi-	
	{ .....	ronde, &c.	
	{ The lacustrine limestone.	The Beauce limestone.	
	{ The pyritous & gypseous mottled	.....	
	{ clays.	.....	
	{ The metalliferous arkose of	.....	
	{ Auvergne.	.....	
	{ Molasse with pyritous lignites of	.....	
	{ Savoy and Dauphiné.	.....	
	{ .....	The Fontainebleau sandstone.	
	{ .....	The upper Nagelfluh.	
EOCENE ...	{ .....	The gypseous marls of Paris.	
	{ .....	The "calcaire grossier" of the	
	{ .....	Paris basin.	
	{ .....	The Brie limestone.	
	{ Sands and clays with pyritous	.....	
	{ lignites of the Paris basin.	.....	
	{ The Nummulitic pyritous lime-	.....	
	{ stones and black shales of the	.....	
	{ South of France.	.....	
	{ Clays with pyritous lignites of	.....	
	{ Provence and Languedoc.	.....	
CRETACEOUS.	{ The chalk, with flints and iron	The white hippurite lime-	
	{ pyrites of Northern France.	stones of the South.	
	{ The chalk marl.	The "Urgonian."	
	{ The upper greensand, with iron	.....	
	{ pyrites.	.....	
	{ The gault, with pyritous clays.	.....	
	{ The pyritous marls of the lower	.....	
	{ greensand.	.....	
JURASSIC ...	{ .....	The Portlandian.	
	{ The Kimmeridgian (rarely) with	.....	
	{ pyrites.	.....	
	{ .....	The Corallian.	
	{ The lower Oxfordian, with py-	The upper Oxfordian.	
	{ rites (= Kellovian).	.....	
	{ The inferior oolite (only at the	The inferior oolite.	
	{ outcrop of the well-known bed	.....	
	{ of pyritous ironstone.	.....	
	{ Liassic, bituminous, and pyritous	.....	
	{ marls, lignites, arkoses, and	.....	
	{ shales.	.....	
TRIASSIC ...	{ The mottled pyritous marls of	.....	
	{ the Keuper.	.....	
	{ The Muschelkalk (very variable	.....	
	{ in distribution).	.....	
	{ The variegated grit (grés bigarré)	.....	



PERMIAN ...	{ The Autun shales (pyritous and bituminous).	.....
	{ Coal measures (only at outcrop of pyritous coals).	Coal measures.
CARBONIFEROUS.	{ Anthracitic pyritous shales.	.....
	{ Metamorphic coal measures, with veins, &c.	.....
	{ Carboniferous limestone.	... ..
DEVONIAN ..	.....	?
SILURIAN & CAMBRIAN ..	{ Schists and other highly-altered deposits, where they contain metalliferous veins.	.....
ERUPTIVE...	{ .....	Granite and gneiss.
	{ .....	Porphyrites and other igneous rocks.

A glance at this table will show that, in France at least—that is in the country where goitre can be best studied, and where it has been made the object of most research—(1) Goitre, although very frequent on limestone is by no means restricted to it; (2) That altitude has no connection with its occurrence; (3) That it is not restricted to marsh districts or deep valleys; and (4) That it does not depend upon the presence of snow-water—all negative conclusions of some importance.

#### 4.—DISTRIBUTION OF GOITRE IN ENGLAND.

Proceeding with the British rocks as we did with those of the Continent, in ascending order, but abandoning the tabular form, we find that goitre is *absent* on alluvial deposits and drift clays, gravels, and sands, where these are of any thickness, the whole of the Tertiary series, including the great London basin, and that of Hampshire and the Isle of Wight. *Present* on the chalk-with-flints, but occurring here in scattered cases only. The rarity of the disease on chalk tells strongly against the theory that it may be due to carbonate of lime alone, but it must be remembered that, for its extent, the chalk is probably the most thinly peopled formation in England. Cases said to be truly endemic are found on this horizon in Surrey, Sussex (as at Newhaven), Hampshire, Dorsetshire (where, however, the writer is informed that the endemicity is doubtful), and Buckinghamshire. In the latter county, Rumsey notes that in the chalk region surrounding the town of Beaconsfield goitre is common, but disappears when sufferers change their residence to the town itself, which stands upon a peninsula of Tertiary (Eocene) London clay overlying the chalk. On the Kentish chalk, goitre is certainly very rare, and Mr. E. Walford, M.R.C.S., of Ramsgate, tells the writer that it is never met with in his part of the county in the course of ordinary practice; this, it will be noted, notwithstanding the fact that the drinking water of the district is extremely chalky and hard. In Norfolk, cases of endemic goitre



are recorded as occurring pretty frequently on the chalk drift, a deposit which, for the purposes of disease-distribution, must be classed with the chalk proper, although belonging, geologically, to a much later period.

*Present* on the upper greensand of Sussex and Kent, as well as on the gault, on Dr. de St. Lager's authority; on the lower greensand, especially about Ampthill in Bedfordshire, and very sparingly in Surrey; on weald clay and Hastings sand, as in the neighbourhood of Tunbridge Wells; at Speldhurst, Haslemere, and Horsham.

*Absent* generally on the entire series of the oolites, except, so far as the writer is aware, in the country about Helmsley, where Dr. J. Bruce Low has observed a number of cases, all of which are attributed by him to the water used, but not (according to his latest statement received quite recently) to the limestone which abounds in all the oolites.

*Very rare* on the lias, but *present* on that formation at South Petherton.

*Absent* on the Rhætic beds, as might be expected from the small area occupied by them in this country.

The new red sandstone series (Keuper and Bunter) has from time to time been accused of being goitrogenous, but the distribution of the disease over the vast tracts of country formed of these rocks is very irregular. Dr. Moffat\* of Hawarden states that in Cheshire, goitre contracted on the carboniferous limestone country is cured on removal on to the new red sandstone. At Crediton, in Devonshire, however, goitre is decidedly endemic, and the same may be said of the village of Wombourne near Wolverhampton, on the authority of Dr. Ballard.† Both places are on

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\* See British Association Reports for 1871 and 1873.

† Report from Select Committee on "Public Health Amendment Act (1875) Amendment Bill." Parl. Papers, 1878. Appendix 3, p. 148. Dr. Ballard's Report to the Local Government Board, on the Sanitary Condition of the Rural District of *Seisdon*, near Wolverhampton.

*Geology.* New Red Sandstone.

p. 152. "While inspecting the village of Wombourne, I observed an unusual number of women with goitre, more or less pronounced. I did not notice anything similar in any of the other villages of the union. All the affected women said they had always, or for a great many years, resided at Wombourne. Of course, it is quite possible that it was a mere matter of accident that I met with goitrous women in Wombourne, and not in other parts of the union; but I have considered it right to mention the fact, and I have requested Dr. Spackman, the health officer, to make special enquiries upon this subject.\* He tells me he knows of no cretins in his Poor Law district, which includes Wombourne. Among the various causes to which a local prevalence of goitre has been attributed by writers upon the subject, one has been the use of water impregnated with iron (Dr. St. Lager, *Brit. and For. Med. Chir. Review*, vol. xlii., p. 17), such as is found in use at Wombourne, but which I did not observe in use elsewhere, except in the little village of Swindon."

\* "Dr. Spackman has forwarded me a list of eight cases of goitre. The ages of these persons vary from 9 to 71 years, and they have been residents either from birth or for periods varying from 27 to 40 years."



new red sandstone. It is somewhat amusing to note that Dr. Moffat relies upon the presence of iron in the red sandstone for the cure of goitre, whereas Dr. Ballard accounts for the prevalence of goitre on the same grounds.

Many discrepancies similar to those noticed above may probably be explained by the fact that the presence or absence of coverings of drift accumulations, so frequently concealing and masking the underlying rocks, has not been taken into account by non-geological observers relying upon ordinary geological maps. None of these maps, except some on the very largest scale (six inches to a mile), and a new series of one-inch agricultural maps now being slowly issued by the Government Geological Survey, show the distribution of the drift. The last-named set of maps will, when complete, be quite the best for use in mapping diseases, mortality, &c.

Formerly, goitre was reputed to be extremely prevalent on the Permian magnesian limestone of England. Unless the cases about Nottingham be referable to this rock (and it does not appear to be probable), no good evidence of endemicity on this division is known to the writer. Notwithstanding the statements to the contrary to be found in most books on the etiology of diseases, the writer must, until better informed, regard the magnesian limestone as practically free from goitre.

The red sandstones of Permian age must, for the purposes of this enquiry, be grouped generally as non-goitriferous, with the Triassic new red sandstones.

*Absent*, also, goitre appears to be on the coal measures and millstone grit, although non-endemic cases are very common in the pit villages of the former series where men and women from other districts are constantly coming and going, and the history of each case is more than doubtful. Dr. Benson, of Stanley, in the county of Durham, once informed the writer that there was reason to suspect true endemicity of goitre on the long coal-measure plateau between the Derwent and the Wear. On the millstone grit, even, such exceptions as these are unknown.

The limestone series of the carboniferous rocks—whether it be represented by the Yoredale type of beds, by the massive limestones of Derbyshire and Bristol, or the ten thousand feet of grits, shales, and thin limestones of the Bernician area—constitutes, in *England*, the great hot-bed of goitre, although there are some striking exceptions to the rule.

Stoney Middleton has the unenviable distinction of being that place in England in which goitre is most abundant. It is prevalent throughout the carboniferous limestone districts of Derbyshire; on the same beds in Yorkshire, where it reaches its maximum of intensity at Hawes. In Cumberland it is very common in the Alston



mining district, where Dr. Savage instituted a very searching and scientific investigation as to its occurrence, the details of which are, unfortunately, not yet published. From this district it can be traced upon the same set of rocks into Weardale and Teesdale on the one hand, and into Northumberland on the other. In the latter county goitre is very prevalent, as in South Tynedale, Alledale, Redesdale, and Upper Coquetdale, and it is apparently confined to the carboniferous limestone series, never encroaching upon the Cheviot porphyrites to the north-west, or on the millstone grit and coal-measures to the east.

In Westmorland, where the same series of rocks occur, goitre seems to be absent. It is found accompanying the limestone again, however, in Flintshire, in the Malvern district, and in the Forest of Dean.

*Absent*, or nearly so, goitre appears to be on the Devonian, old red sandstone, Silurian, Cambrian, and pre-Cambrian rocks; and the same may be said of granites, porphyrites, and the igneous rocks generally.

In reviewing the above facts, it should be borne in mind that only a brief résumé of a large body of details has been given.

#### 5.—COMPARISON OF RESULTS.

In England, as in France, one point—and one alone of any importance—seems to be established as being common to those rocks on which goitre is found not to occur: the absence of limestone, together with that of metallic impurities, and especially sulphide of iron. In both countries the rocks which support most goitre are such as are both calcareous and metalliferous. But there are plenty of facts to show that metalliferous impurities alone cannot be credited with the origin of the disease, else the Devonian and the granite would surely not be free from it. Neither will the absence of limestone alone be sufficient to check the growth of bronchocele, else the lignitiferous beds of France and the ferruginous sands of the Weald would not support it.

On the whole there is a striking sameness in the geological distribution of the disease in the two countries, a sameness which would be rendered still more conspicuous were it possible, in a paper of this kind, to enter into purely lithological details.

#### 6.—CONCLUSION.

Instead of concluding with the enunciation of a theory of his own, for which he believes that sufficient evidence has not yet been accumulated in this country, the writer will end this paper by quoting, without comment, the following words of Dr. de St. Lager:—

“It follows,” he says, “from his investigations, that endemic goitre coincides with metalliferous deposits. In the first rank is



iron-pyrites. It is the most abundant and the most universally distributed substance, the only one which is never wanting. Its presence manifests itself by means of crystals of sulphate of lime in calcareous rocks ; of sulphate of lime and sulphate of magnesia in dolomitic deposits ; and of efflorescent sulphate of iron in other rocks."

The PRESIDENT said that he had listened with great interest to the address from Professor Lebour. From childhood, as a native of Derbyshire, he had been familiar with Bronchocele, commonly called the "Derbyshire Neck," as being more frequently found in that county than any other. He remembered what quantities of Iodine ointment were used, in his early days, for the cure of this disease, especially at the commencement. The county of Derby was of very varied aspect—mountainous in the north-west, where the carboniferous or mountain limestone prevails ; hilly in the east, where the coal measures are found, and flatter in the south, where the soil is more alluvial. It is in the mountainous part, the old "Peak-land," where bronchocele has its chief home. He knew well the village of Stony Middleton, which we had just been told was the most marked place for the development of this disease. It was built amongst the rocks, in a very picturesque manner. The water from the limestone was generally considered as the cause of the prevalence of the disease. The hospital at Nottingham was noted as having the largest number of patients subject to bronchocele, and limestone is also plentiful in that neighbourhood.

Dr. BOWMAN said that in contradistinction to the limestone rock theory of the origin of goitre, many cases of this disease were found in Calcutta, and that in Lower Bengal, there were villages in which it was the exception to see a person free from goitre. That in these districts, and especially about Calcutta, the alluvial deposit is so thick that practically it is impossible to find rock, and, therefore, all stone for building purposes must be brought from a considerable distance.

Mr. SPEAR remarked upon the rarity of goitre in South Shields, a district, supplied by water from the magnesian limestone.

Dr. GIBSON said Professor Lebour had shown that endemic goitre abounded in localities in which certain geological formations were found. And it could hardly be doubted that the geological peculiarities were largely concerned in the manifestation of the disease: that the goitre became endemic by virtue of this relationship. But Professor Lebour also shewed that the geological formations associated with endemic goitre were exceedingly varied. The conclusion was inevitable that no one geological formation was necessarily operative in the generation of the disease. Other terrestrial conditions also were observable in its development. It was found



in close valleys, as at Valais; and it was found on the shores of the polar seas, as at Edmonton; while isolated cases of the disease were found almost everywhere. Dr. Gibson concluded from all this that while endemic goitre was commonly found in localities having geological peculiarities—as in magnesian limestone districts—and probably largely dependent upon them, yet that it often occurred in districts where no such peculiarities were to be found, and that it was developed, even endemically from agencies which were not geological at all.

Mr. ARMSTRONG agreed with Dr. Gibson that the causes of goitre were probably numerous, and not to be explained by Geology alone. In reference to the continental statistics spoken of by Professor Lebour, the conclusion formed after the exhaustive enquiry instituted in the Sardinian States, as described by Boudin (*Traité de Géographie et de Statistique Médicales*)—was, that the disease was due to a great variety of general unsanitary circumstances, and the action taken was in accordance with this view, viz.:—The drainage of marshes, the avoidance of close valleys for building habitations in, ventilation, the provision of good food, the encouragement of commerce through affected districts by opening out roads, &c., &c. The speaker did not know of any relation between limestone and ferruginous rocks or soils that they should be accredited with causing disease. Iron was blamed, as mentioned by Sir Ranald Martin, as the cause of certain diseases in tropical climates, but the reason for this did not appear to be well established, and perhaps it might be the same in the case of goitre and the metalliferous formation.

Dr. GOWANS said: Sir, I can confirm the statement of Mr. Spear as to the non-prevalence of goitre in South Shields. You may be aware, sir, that that borough and neighbourhood, as well as Sunderland, are supplied with water taken from deep wells sunk down to the magnesian limestone, and pumped up by means of steam power. It was prognosticated by some persons at the time the Sunderland and South Shields Water Company mooted their scheme, that goitre and stone would become common diseases amongst those persons who used the water. This opinion has not been verified. Stone is a rare affection there, and during my 13 years' residence in South Shields, I do not think I have seen more than a similar number of persons with enlarged thyroid gland. I hold the appointment of Medical Officer to the Wellesley Training Ship, stationed in the river Tyne, and singularly enough six of the band boys became affected with bronchocele. They are supplied with water by the North Shields Company, and they may be said to reside on no geological formation whatever, seeing that they reside on the water. My general experience of the disease inclines me to the common view of the profession, that goitre is due to a



combination of circumstances rather than to a single cause. But Prof. Lebour, to my mind, has demonstrated that the presence of certain metallic salts in the soil, influences in a marked manner its etiology.

Professor LEBOUR having replied,

Dr. GIBSON proposed and Mr. H. E. ARMSTRONG seconded, "That the warmest thanks of the Society be accorded to Professor Lebour for his very able paper."

Carried by acclamation.

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#### PATHOLOGICAL TRAY.

Dr. MURPHY said: This, sir, is a pocket obstetric case I got Messrs. Arnold and Sons to construct for me. Being made of leather, on a steel frame, and opening like a cigar case, it occupies but little room, and contains in one side a bottle for liq. secalis, another for sulphuric æther for hypodermic injection in cases of extreme collapse; a hypodermic syringe and two smaller bottles, one for morphia for use either hypodermically or by the mouth, and the other for ergotine for *intra-muscular* injection. In the other side are two nozzles for the syringe, a pair of scissors, and a catheter; and behind, a pocket for ligatures, which contains another pocket for pins. As regards the ergotine, I use the word "*intra-muscular*" instead of "hypodermic," as it is now generally injected well into a muscle, by which means abscesses are avoided which so generally followed when it was injected only beneath the skin.

This is a photograph of a large multilocular cyst growing upon the front of the neck of a woman, aged 42 years. She had noticed it for 17 years, and, as it still continued to grow, she applied to me in the hope that it could be removed by medicine without any surgical operation. This I assured her was more than I could accomplish, and I suggested excision, which she would not consent to, but finally I effected a compromise, and I was to be allowed to tap it with a trocar and cannula, which I accordingly did. Having emptied the largest cyst, I re-introduced the trocar and tapped another cyst through its wall, and in like manner the rest, in all six cysts. I then injected iodine, and in a few days the whole tumour became filled with pus, which I was allowed to evacuate with a free incision; and then dressing the wound from the bottom I had the satisfaction, after some time, of seeing the wound heal, and the tumour presented only a small thickening over the trachea, but whether it has continued so or refilled I cannot say, as Christmas—which terminates many acquaintanceships—coming on, I sent her the usual professional greeting, which was returned to me with the remark—"Gone; left no address;" nor have I heard or seen anything of her since.



This photograph also represents a hydrocele of the neck, consisting of an immense number of cysts, which has been growing for over fifty years without causing any inconvenience, except from its appearance and weight. It commenced as a small tumour underneath the ear, and has gradually extended, now it occupies the whole space from the ear to the clavicle, extending nearly to the cervical vertebræ behind, slightly overlapping the larynx in front. As the patient is æt. 73, and the tumour causes her so little trouble, she is reluctant to part with it, and, considering its situation, and the extent and depth of its attachments, I could not conscientiously tell her she was unwise.

These next photographs represent a very fine specimen of meningocele which was brought to me at the Sunderland Hospital for Women and Children last summer. There is a tumour fully the size of the head springing from the occipital bone, which in early foetal life is usually composed of four distinct centres of ossification. This tumour was as transparent as a hydrocele, and consisted apparently, of one large cavity which contained only fluid, communicating with the interior of the skull, and its pedicle which attached it to the occiput was the thickness of a man's wrist. The tumour was so tense, and the covering so thin that there was the danger of its bursting at any movement of the child, so I determined to remove some of the fluid, which I accordingly did with an aspirator, and drew off about five-sixths of its contents. I then applied pressure by means of long strips of plaster round its head, and for some time the child, who was four months old, and had been born with the meningocele about the size of an orange, did very well, but while I was abroad for my autumnal holidays, the tumour re-filled, and being tapped with a large trocar and cannula, the child died next day, and, unfortunately, no *post mortem* examination could be obtained. Though operations have frequently been undertaken for the removal of this disease, I am acquainted with only two successful cases, one in which Paget "used iodine with success;" and another in which Annandale, an honorary member of this society, "applied a ligature to the pedicle and removed the tumour, the child recovering completely, in spite of an attack of measles."

Dr. MURPHY also exhibited a foetus of four months, whose head and neck were very much deformed.

Dr. DRUMMOND, in Dr. Philipson's absence, showed a phthisical lung, containing a very large cavity, removed from the body of a patient of Dr. Philipson's, who died in the Infirmary a few days previously. Bands like round cords passed from one side of the cavity to the other, made up almost entirely of arteries.

Dr. ARNISON showed a tracheotomy tube which he had recently



invented. It was made on the respirator principle, the outer extremity being composed of a box containing several discs of fine wire gauze.

Mr. ARMSTRONG exhibited a specimen of ham containing entozoa, and stated that after careful but unsuccessful microscopical search, in the expectation of finding cysticerci (which the parasites, to the naked eye, resembled), he had consulted Dr. Mears, who kindly examined several of the bodies, but also without finding the characteristic hooklets of the cysticercus. The bodies in the ham agreed in general and microscopical appearance to the organisms known as "Rameys Capsules" (the so-called Psorospermia).

Dr. DRUMMOND presented the liver which had been removed that day from the body of a patient who died in the Infirmary from malignant disease, and said: This liver, sir, weighs a few ounces over 20lbs. It is, as you see, the seat of extensive cancerous degeneration. Being quite fresh, the appearances are very characteristic. The nodules are soft and pale cream coloured, and are evidently of the nature of encephaloid cancer. They vary in size on the surface, from a very large orange, to a split pea. The patient from whose body the organ was removed, was admitted into the Newcastle Infirmary, on the 20th January of present year, and he died yesterday, March the 9th. He was 46 years of age, and complained for six months before admission. At first he was sadly troubled with dyspeptic symptoms—his "food lay heavily on his stomach." Occasionally he suffered from attacks of pain over the liver, but as a rule he was wonderfully free from pain, even during the last few weeks of his illness. Six weeks before death he became deeply jaundiced. The staining continued to the end. The diseased organ grew rapidly during the last three months. On admission it was observed to occupy the greater part of the abdomen. His family history was good. His occupation was that of a labourer under the Newcastle Corporation.

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# SCARLATINA IN THE COUNTY OF DURHAM, WITH CERTAIN CONSIDERATIONS CONCERNING THE ETIOLOGY OF THE DISEASE.

By JOHN SPEAR, M.R.C.S., Inspector Local Government Board.

MR. PRESIDENT AND GENTLEMEN,

At one of our recent meetings I ventured to suggest the propriety of an investigation, on the part of the Society, of the subject of scarlatina prevalence in these northern counties. The subject is of vast general interest, for the disease, unlike some other of the zymotics, shows no indication of relaxing its baneful hold on the population of England; its prevalence, indeed, even appears to be increasing, as density of population, and the circumstances of a freer personal intercourse, increase.\* And great as its general interest is, the subject (as I propose to show) is one of special concern to the medical profession of the north.

In the last annual report of the Registrar General the number of deaths from scarlatina in each of the counties of England during the preceding eleven years (that is from 1868 to 1878 inclusive) is given. In England the average annual death rate from this disease during the period named was 0·87 per 1,000. Durham heads the list of counties in the order of scarlatinal fatality, with a rate double that average, namely, 1·74 per 1,000; whilst Northumberland, with a rate of 1·24, is in a position only a little less unfavourable.†

In the annexed table the scarlatinal mortality in the county of Durham during the last thirty years is examined in a little more detail.

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\* So stated in the "Supplement to the Thirty-second Annual Report of the Registrar General."

† A similar computation was made by Dr. Buchanan for an earlier period, for the 22 years 1851-72 (inclusive). The average annual rate for that period in Durham was 1·41; Lancashire, with a rate of 1·33, showed the next highest county rate; and Northumberland the next, with a rate of 1·16 per 1,000.



*Scarlatinal Mortality in each of the Registration Districts of the County of Durham during the three decenniad 1851-60, 1861-70, 1871-80.*

DISTRICT.	POPULATION. Estimated mean population of last decenniad.	Average Annual Death Rate per 1,000 from Scarlatina.			MEASLES. Average Annual Rate per 1,000, 1871-80.
		1851-60.	1861-70.	1871-80.	
COUNTY .....	.....	1·20	1·62	1·36	.....
Darlington ... ..	51,000	0·66	1·10	0·67	0·26
Stockton .....	67,000	{ 0·8 }	1·46	1·7	0·50
Hartlepool .....	46,500		1·40	1·3	0·34
Auckland .....	80,650	1·37	1·97	1·53	0·45
Teesdale .....	20,200	0·85	0·60	0·62	0·14
Weardale .....	20,660	0·98	0·88	0·68	0·26
Lanchester.....	55,521	{ 1·36 }	1·66 }	1·33	0·29
Durham .....	57,457			1·36	0·46
Easington .....	37,300	1·56	2·15	1·40	0·55
Houghton-le-Spring..	28,770	0·92	1·72	1·36	0·50
Chester-le-Street ....	36,600	1·40	2·0	1·46	0·36
Sunderland .....	126,500	1·17	1·55	1·40	0·39
South Shields .....	94,000	1·60	1·75	1·30	0·34
Gateshead .....	93,500	1·33	1·86	1·57	0·38

Darlington, Teesdale, and Weardale, are the only three districts that show a scarlatinal mortality within the average rate of the country; in all others the mortality is sustained at an excessive ratio—a ratio varying within singularly narrow limits, from 1·33 at Houghton-le-Spring to 1·62 at Auckland. It should surely admit of some explanation that a town district like Darlington should have, over a long period, uniformly moderate rates of scarlatinal mortality, so that the average for thirty years is no higher than 0·81 per 1000 per annum, whilst so many neighbouring districts are sustaining rates twice or nearly twice as high. For it does not appear that the mortality of the latter districts are due to exceptional epidemics; in each decennary, in almost each quinquennial period indeed, the rates in the one case are excessive and in the other are low. The disease in these districts showing excess, is constantly present. At more or less frequently recurring periods it becomes widely diffused, but throughout the intervals numerous sporadic cases occur; so that each district sustains within itself a constant succession of the contagious element. These periods of epidemic prevalence recur at irregular intervals, it seems, not, at least, in regular cycle, as has been recorded of certain scarlet fever outbreaks elsewhere; but, agreeing herein with general experience, such prevalence usually commences in the autumn of the year.

It is these intermediate sporadic cases that require to be energetically dealt with by a sanitary authority, for they serve to keep



alive the contagium in a district, and it is the circumstances which determine the constantly recurring epidemic prevalence of the disease that, in my opinion, this Society might well investigate, with such a wealth of material for work before them.

The exceptional prevalence of scarlatina in the county is, doubtless, in some degree attributable to the character of the population. It has been a very rapidly increasing, and is consequently a young population, containing an unusual proportion of children living at ages when scarlet fever is most destructive. But the direct influence of this factor admits of accurate estimation, and it will be found wholly insufficient to account for the excess observed. Taking the mean of the two last censuses (1861 and 1871), the proportion of children below the age of 15 years to the total population was, in England, 36 per cent.; in the county of Durham, the corresponding proportion was 39, or 3 per cent. more; in other words, the excess in the number of children at this age living in the county, as compared with the whole of England, was equal to 19,273. Now let us eliminate the scarlatinal fatality amongst these 19,000 children from our computation of the death-rate. In Durham, such fatality amongst children of this age is equal to 4 per 1000 per annum, therefore we must deduct  $19 \times 4 = 76$  deaths per year for our amended calculation. The result will give a death-rate for the period (1861-70) in question, of 1.50 per 1000, instead of 1.62, the actual rate. The correction, it will be seen, amounts only to a unit in the first decimal figure, or, to speak accurately, to  $\frac{12}{100}$ ; and this is the direct influence of what may be termed the extraordinary youthful population of the county upon its average scarlatinal death-rate.

But, it may fairly be urged, the condition remarked upon exerts, beyond this, an indirect influence in the same direction—that in the case of such a disease as scarlet fever the risk of infection to each susceptible individual of a community increases with the number of such susceptible individuals which the community contains; and, although in the above calculations the 76 deaths (representing, say, 760 cases), amongst what has been regarded as an excess in the proportion of susceptible persons, have been eliminated; yet the additional risks to which others have been exposed by the existence of those cases is not thereby expressed.

The consideration does, no doubt, suggest a factor in the scarlet fever prevalence, although its precise value is difficult of estimation.

Equally difficult to estimate is the influence of other conditions coincident with early commercial activity and rapid increase of population. The mining villages, in which so large a proportion of the population is aggregated, present most of the special dangers to health to which towns are subject, whilst compensating advantages, in the shape of improved sanitary administration and pro-



visions, are generally absent. Many of these villages are situated in rural sanitary districts, the authorities of which are perhaps not even yet invested with the urban powers of regulating building operations, or of requiring effective provision for sewerage and paving. Most, probably, of the colliery villages of Durham have arisen in the absence of such supervision ; and many, furthermore, have been constructed in full view of the possibility that, since collieries cannot be worked for an indefinite time, they may soon become "deserted villages," to which no poet will ever tune his lay. How, under such circumstances, can effective permanent sanitary works be expected? If, as is the general belief, the habitual breathing of a polluted atmosphere, or the habitual use of impure water, predisposes a population to the ravages of epidemics; if a totally inadequate supply of water for domestic purposes may contribute to the rapid diffusion of infectious maladies, as we might expect from the difficulty, under such circumstances, of securing cleanliness and proper means of disinfection; if morbid germs may accumulate, as we have much reason for believing, in an undrained and sewage-polluted subsoil—then, no doubt, all these causes are contributing to the extensive prevalence of scarlet fever in this county. In the mining villages, again, there may be, perhaps, an exceptional amount of social intercommunication. The houses are built so that there is rarely any division between yards and out-premises; the inhabitants are engaged in the same employment, and have, accordingly, much community of interest. As a result, there is much personal intercourse; and when infectious disease appears, the claims of good fellowship seem to the people to forbid its discontinuance; although I know from experience that the danger of such intercourse, at such a time, is generally recognised, and would gladly be escaped from. I believe if a cottage were set apart in each colliery village for the reception of cases of scarlet fever, the provision would be accepted as a great boon by the inhabitants.

But these are subjects which more especially concern health officers and sanitary authorities, and if I have troubled you with them, my desire to see the medical profession as a whole assisting the one and encouraging the other—a truly potent influence if persistently applied—must be my excuse.

Since all useful investigation of the more mysterious phenomena that characterize the invasion, either of communities or of individuals, of the scarlatinal infection must, I take it, proceed upon a due appreciation of observed facts bearing upon the nature of that infection, I may be permitted to say a few words in this regard. Probably we all agree that scarlatina is due to a specific contagium, which, so far as all evidence at present goes (and as, indeed, from its specific nature we might expect) never originates spontaneously, but is transmitted always, directly or by various mediate vehicles,



from a precedent case of the disease ; and, further, that this contagium (and this is a necessary corollary to the proposition of its specifiveness) always produces in the infected individual, however diverse in degree the symptoms, the true scarlatinal affection, and no other. Certain observers incline to the opinion that in the micrococci which are often found in the blood and tissues of scarlatinal patients, the contagious element can be recognised ; and although this observation must be regarded as yet as inconclusive, yet there are cogent if not conclusive reasons for believing not only that this element is *particulate*, but that it is a living organism or its germ. The infinitesimal quantity required for the infection of an individual, and its then enormous power of development and multiplication ; its sustained potency, both in a latent condition and through these changes of development ; its transmissibility by mediate vehicles ; the specifiveness of its effects, including the phenomena of incubation and the definite nature and duration of the symptoms it evokes in the infected individual, all point to this conclusion ; while the analogy we are afforded by other diseases of known parasitic origin, together with our inability to explain the phenomena observed on any other hypothesis, render that conclusion almost a certainty.

Now one of the most marked features in the operation of this contagium is the different degrees of susceptibility which different individuals, and even different communities of individuals, manifest towards it, and, it seems to me, that if health officers have a superior opportunity to the medical practitioner to investigate the nature of the contagium itself, the means by which it may be destroyed, and the extrinsic conditions which govern and aid its diffusion, it is to the practitioner that we ought largely to look for a study of those *intrinsic* conditions of individuals, and of the various external physico-chemical influences which, in a measure, regulate those conditions, and which may be at the bottom of this mysterious but all-important factor, in the attacks of contagia, of susceptibility.

That an investigator would be on the right tack in so doing is almost certain ; for although it is conceivable that a contagium may act with varying force by reason of its own innate activity, yet this hypothesis fails to explain the few facts we do know in this connection. It is true that whole epidemics may be marked by exceptional virulence or unusual mildness ; but how much oftener do we see in the same outbreak cases of malignancy, and cases of peculiar mildness down to mere rudimentary attacks, side by side, the one apparently giving rise to the other. Other individuals, again, notwithstanding every opportunity for infection, may exhibit a complete immunity, which may be permanent, or which may desert them after a time, as evidenced, amongst other experiences,



by late attacks in families. Ought not the precedent life-conditions of these individuals to be carefully investigated and compared? The immunity that one attack, in the case of most of the infectious diseases, confers upon an individual is only to be explained by some condition attaching to the individual himself; perhaps to some destruction or change (as Liebermeister suggests) in the chemical or morphological constituents of the body; and, again, similarly explicable, there is the apparently undoubted fact of *family* predispositions or immunities. Moreover, some little hope is afforded us by observations that have been made in respect of certain of the diseases of this class, meagre though those observations be, that the factors which determine susceptibility may not be undiscoverable, or may, perhaps, if discovered, not prove to be wholly beyond our control. In malarial fevers, a disease which, it may now fairly be claimed, is of parasitic origin, cold, resulting in a chill, may, it seems certain, call long latent germs in the body to life and activity. During epidemics of cholera, when, according to Lebert and others, a large proportion of the population may be under the influence of the latent or only incompletely developed poison (as indicated by the extensive prevalence of peculiar diarrhoeal affections), errors of diet, and excesses of various kinds, will seem often to determine the full accession and complete development of the disease. This observation has been made by several competent observers in Germany and in this country, and its significance believed in by them. Anthrax, again, a disease which I have recently been engaged in investigating, is readily communicated to herbivorous animals, while the carnivora are only with great difficulty infected; and Feser, of Munich, has shown by a long series of experiments that the susceptibility or immunity of rats to this disease may be determined by their alimentation. In my forthcoming report on this disease in the human subject, I shall be able to adduce some curious evidence, which may, it is possible, bear a similar interpretation. It is conceivable that certain foods may provide such material to the blood as will render that fluid a richer field for the proliferation of disease germs.\*

Before concluding, I would briefly refer to two conditions which are often said to influence susceptibility to the scarlatinal poison—namely the pre-existence of other diseases, and age. It has been said that the strumous diathesis confers some protection, but of this I know no evidence whatever. There does, on the other hand, appear some evidence of relation between outbreaks of measles and scarlatina in certain localities. Löschner and Kostlin, from observa-

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\* Statistics show that infants below the age of one year are much less liable to fatal attacks of scarlatina than are older children; and I find it is a common belief amongst the mining population of Durham that *suckling infants* rarely take the fever.



tions made at Stuttgart, concluded that epidemics of scarlet fever were extremely apt to follow those of measles, and Kostlin speaks of the one disease as preparatory to the other. If this sequence generally obtained, it would, it is evident, afford a valuable indication to health officers and sanitary authorities: cases of scarlet fever after the prevalence of measles would be invested with a peculiar significance. I have represented in this diagram the range of the mortality from the two diseases, in the county, during each quarter of the last eleven years. On the whole, the experience here portrayed tends to agreement with the German observations—an epidemic prevalence of measles during the spring is often associated with the same of scarlet fever in the autumn, and, on examination, the mortality of each district also shows this sequence not infrequently. There are, however, many exceptions; but this, of course, in any case is to be expected, since the only suggestion is, I presume, that, given the scarlatinal poison and a susceptible population, the pre-existent wide prevalence of measles is another factor adding to the susceptibility. What the relation is, if it exist, I am not able to suggest; perhaps it is brought about only by a third or common influence. I am inclined to think, from my experience, that convalescents from measles may show a high susceptibility to scarlatina when the latter disease prevails; but the subject requires more extended investigation.

Age has been asserted by many observers to confer relative immunity. Murchison, examining the subject from a statistical point of view, arrived at this conclusion; and numerous observations of epidemics in isolated regions, where scarlatina seldom prevails (many of which are recorded in Louis Thomas' article on Scarlatina in Ziemssen's Cyclopædia), have shown that only a small proportion of the adult population have suffered. This, too, is the general experience—it is certainly my experience—in this country, as regards adults said to be unprotected by previous attack. The rudimentary attacks to which such adults seem often to be subject afford, too, very strong evidence on the point. It is comparatively rare to see abortive attacks in children.

If the English life-tables be examined with a view of elucidating this subject, it will be found that, estimating the number of non-fatal cases to deaths at 10 to 1, of 1,000,000 live-born children, 197,549, or nearly 20 per cent., suffer before reaching the age of five years; the fatality in the first year of life being scarcely one-third that of the following years. In the second quinquennial (5-10), of the children left alive and entering upon that age, *minus* the number estimated to have previously suffered from the disease (a number equal to 557,228), 17 per cent. are attacked; from 10—15, 4·8 per cent. of the unprotected entering upon that age suffer; from 15—20, 1·4 per cent.: from 20—25, 0·84 per cent.:



and thereafter only 0·2 per cent. of those estimated to be left unprotected suffer before the end of life. Of course it may be urged that there are many elements of error in calculations of this kind; we cannot, for example, estimate, without a wide range of possible error on either side, the mean fatality of the disease—a fatality which differs at different ages; and, because this is so, I have not thought it worth while to calculate the actual mean sick-rate at each age, but only to give the proportion of persons estimated to enter a given age unprotected, who may be expected to suffer before that age is passed. It may be said against the whole argument of age as a protective factor, that large numbers of children suffer, and are so protected, but in so mild a way that the disease is unrecognized. This may be so; but it seems to me unlikely, or surely records of numerous mild attacks amongst the better classes of society and in institutions would be found. Or it may be urged that many from earliest age possess immunity and retain it through life. But these objections bring us again to the great subject of susceptibility. Can we discover the factors that determine this condition? That is the main question—the question which, it seems to me, is so worthy of patient research.

Mr. SPEAR showed the scarlatina and measles mortality of the County of Durham, during the four quarters of the last eleven (?) years, in diagrammatic form. The diagram showed that, during epidemics of measles in the above years, the fatality of that disease was constantly and markedly highest during the second or spring quarter; whilst in epidemics of scarlatina, the third or autumn quarter showed the same relative excess. It further appeared that a high mortality from the two diseases, in respect of years, was almost always co-incident, so that it seemed that the mortality from measles in the second quarter of the year formed some measure of the scarlatinal mortality to follow in the autumn. Another diagram, showing the returns of sickness from the two diseases in dispensary practice (Reports of the Medical Officer of the Privy Council), went to prove that this seasonal excess was not the result of a merely greater *fatality* of the two diseases during certain periods, but of their actual greater prevalence.

Mr. ARMSTRONG said, in reference to the subject of age and susceptibility to scarlet fever, that at a previous meeting of the Society, when Mr. Spear had (as now) stated that adults were actually less liable to contract the disease than children, he (the speaker) had asked Mr. Spear for the authority on which that statement was based. Certainly more children suffered than adults, and there was a *primâ facie* appearance of diminishing liability to contract scarlet fever with advancing age; but the evidence on this point appeared to require investigation. On the



other hand there was the opinion of Sir Thomas Watson (Practice of Physic), who, after giving instances of the disease in adults, and mentioning the well-known fact of its prevalence among parturient women, says :—"The contagion of scarlet fever is active and widely diffused. Few children escape its agency. Few are capable of taking the disease a second time. It follows that scarlet fever is rare in adult life. \* \* \* Yet it is not unknown." Dr. Bristowe, an experienced Medical Officer of Health and Physician, and therefore entitled to double weight as an authority, in reference to scarlet fever says (Theory and Pract. of Med., 1880) :—"Children suffer from it in much larger proportion than adults; not, however, because there is any special proclivity to it in childhood, but because, from its frequent prevalence and highly infectious nature, the great majority of children are exposed to its influence during the first few years of life, contract it, and thus acquire protection."

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## ON ANÆSTHESIA.

By DAVID DRUMMOND, M.A., M.D., Physician to the Newcastle-upon-Tyne Infirmary.

[CONCLUDED FROM PAGE 123.]

Cases of anæsthesia are frequently to be met with which are intermediate between that which is strictly functional and the undoubtedly organic in origin. I refer to a group of cases, the symptoms in which are apparently due to sympathetic or vaso-motor changes.

It is by no means unusual to find anæsthesia in exophthalmic goitre ; or again, in many cases of so-called functional epilepsy, is it possible to demonstrate a distinct sensory impairment. This condition occurs in Grave's disease, concurrent with other neuroses—sudden flushings, sudden perspirations, periods of anorexia with rapid wasting, irritability of temper, headache, giddiness, &c. The anæsthesia in these cases resembles very closely the form found in hysterical cases, but the loss of sensibility is seldom very marked, rarely attaining to the same degree of severity as in hysteria. The impairment is nearly always analgesic, the loss of sensibility consisting most frequently in a blunting of painful sensations. There is generally a complaint of “needles and pins,” or other *paræsthesiæ*. The distribution of the analgesia is commonly, as in hysteria, irregular—one arm or one leg—and the area of anæsthesia corresponds with the part in which the *paræsthesiæ* are felt. Muscular sensibility is not affected, or at least the disturbance is too slight to be recognised by the usual tests.

The following case will serve to illustrate the occurrence of anæsthesia in exophthalmic goitre :—

Mary B., aged 30, single, a cook, came under observation as an unusually well-marked case of Grave's disease. The commencement of her illness dated back two-and-a-half-years. The eyes were exceedingly prominent, whilst her heart and neck were equally typical. The left leg was felt to be “numb.” The æsthesiometer discovered the fact that the “numb” leg was somewhat anæsthetic as compared with the right one. Thermal tests also elicited some degree of loss of sensibility of left leg. But painful stimuli yielded much more distinct evidence of sensory impairment. There was no loss of muscular sense. As far as it was convenient to pursue the investigation, the loss of sensation was confined to the left lower extremity.

As in exophthalmic goitre, so in epilepsy, the phenomenon is analgesia. Care must be taken not to confound the loss of sensibility induced by large doses of the bromide, with the anæsthesia which has been antecedent to the exhibition of that remedy.



The following two cases, taken from a considerable number of examples of epilepsy, in which anæsthesia was present, demand but a brief notice :—

Isabella L., aged 22, was admitted into the Newcastle Infirmary for epilepsy. The seizures, nine of which only had occurred, commenced 14 months before she came under observation, and were evidently genuine. She frequently complained of giddiness and headache. There were no changes to be made out by the ophthalmoscope. She had not vomited since the commencement of her illness. The whole body was more or less analgesic, whilst the slightest touch with the head of a pin was discovered, and almost exactly localized. The left leg was most affected. Scattered over the body were limited areas in which the prick of a pin caused pain. The muscular sensibility was normal.

In the following case the sensory condition was very similar to that which obtained in the one just related, except that the analgesia was not so extensively distributed, being confined almost altogether to the lower extremities.

Annie W., aged 18, came under observation for epileptic fits and headache. Her illness was ascribed to a fright which she experienced during a domestic fracas twelve months previously. The fits returned about every eight or ten days. Five months before she was first seen, her friends noticed that the left pupil was markedly dilated. Headache and giddiness were commonly complained of. The dilated pupil—a very striking feature in the case—reacted very slightly to the stimulus of light, whilst the right pupil was normal. The dilatation of the left pupil remained as a constant condition whilst the case was under observation.

It was often observed that she blushed more on the right side than on the left; whilst sudden perspirations were common, and especially marked on the left side. Her temperature taken by means of the surface thermometer was generally a degree and a half higher on the right side. Her lower extremities were analgesic, whilst tactile sensibility was almost normal.

An interesting phenomenon was observed in the case, which, though not bearing upon the subject of the paper, demands a brief recital. It was observed that when the patient fixed her eyes upon some object a few feet distant—say the finger—and this object slowly made to approach her face, as it reached four or five inches from her nose, both axes still concentrated upon it—actively converging—she started, the whole body becoming momentarily tremulous, especially the upper extremities, the elbows being suddenly jerked into the sides, and for a few seconds the right arm and hand vibrated markedly. This spasm lasted about five seconds, and invariably occurred when the patient accommodated for a near point in front of the face; but when the object was held

to one side, or gradually made to approach the eyes towards the right or left, it failed to occur, *i.e.*, the spasm only took place when both axes converged in accommodation.

In cases of chorea also, I have observed sensory paralysis, and that both in children and adults. In one case, that of a child aged seven years, treated by hypodermic injections of curara, the needle was inserted under the skin of the right forearm several times without causing any inconvenience.

Into the limbs of a patient recently under my care for general chorea, aged 50, a pin could be thrust without any complaint; indeed, in his case the analgesia affected the whole of the body, whilst tactile sensibility was almost unimpaired.

It is, no doubt, a difficult matter to explain the anæsthesia in such affections as chorea, exophthalmic goitre, and functional epilepsy; but, as already hinted, I am inclined to the view that the vasomotor nerves are at fault in such cases. Probably the blood supply in the brain to such areas as the posterior part of the internal capsule, or the sphenoidal fasciculus, or the hippocampal region, is imperfect. Perhaps, however, the question in this direction is not more difficult than that which presents itself for solution in so-called hysterical cases.

It is unnecessary here to allude to the loss of sensation due to the use of the so-called *anæsthetics*—chloroform and ether; nor need the anæsthesia induced by narcotics—opium, belladonna, &c., engage our attention.

From what has been said already regarding functional anæsthesia, it will be seen that muscular anæsthesia has rarely an hysterical origin, being generally symptomatic of organic cord or brain lesion; so, with a brief consideration of this sensory phenomenon I shall initiate my remarks on sensory impairment due to organic disease.

Without entering upon the vexed question regarding which physiologists are still disagreed, *viz.*: Do special nerves exist for conveying impressions from the muscles to the brain?; or, are the centripetal channels simply sensory nerves which traverse muscular tissues on their way to supply sensitive areas?; it may be assumed that certain sensations are referred to the muscles, and are generally described as *muscular sensibility*. Some of which sensations are painful, as in cramp, or when a muscle is powerfully stimulated by a Faradic current, whilst others are analogous to the cutaneous tactile sensibility, and are of service in estimating weights, and the amount of force to be put forth on any given occasion.

It is generally agreed that the paths which convey these muscular impressions pass to the cord by the posterior roots, though Brown-Séquard would appear to regard the anterior roots as the possessors of the centripetal muscular fibres.

The question arises—what actions do we commonly perform in



health by the aid of this *muscular sense*? The answer to this question is important, for, it will be found to be the key to the recognition of muscular anæsthesia. It is obvious that impairment of the *muscular sense* cannot be made out in the same facile and direct manner as can cutaneous anæsthesia—the cutaneous sensory nerves interfering considerably with the full isolation of the *muscular sense*, as when this sense is tested by weights or electrical currents.

Through the muscular sense we are able to place the limbs in any required position, and that with the eyes closed; or, in other words, the muscular sense furnishes valuable information regarding the position of the limbs. As well, it will be generally conceded, is the muscular sense a great aid in maintaining the equilibrium of the body, when the eyes are closed, by yielding information to the intra-cranial co-ordinating centres. I say aid, as it is impossible to overlook the important part played by other sensory surfaces, such as joints, skin, ligaments, &c. In distinguishing between weights the information we require is supplied by this sense.

Theoretically the muscular sense may best be tested by a Faradic current. The strength of the current being gradually diminished, the patient states when he ceases to feel the *sense of contraction*. This, on comparison with a normal standard, furnishes the required information. However, in practice it will I think be found that like the æsthesiometer as a cutaneous test, the Faradic current is of small service. As a test for muscular pain it is of great value, inducing an artificial cramp. At best our tests for the muscular sense are rough in the extreme; for although muscular analgesia can be recognised with almost absolute certainty, yet muscular anæsthesia will often escape detection, no matter how carefully we pursue our investigations; especially if it be, as no doubt it often is, limited in its distribution. When the change affects an extensive area, as in many cases of *tabes dorsalis*, the impairment may be recognised by placing the individual in the so-called “ataxic position,” *i.e.*, standing with the feet close together and the eyes closed; or by requiring an accurate description of the position of the limbs, placed by the observer in various positions whilst the patient is lying and keeping his eyes shut. When it is required to test the upper extremities, it is useful to make the patient distinguish between weights, in which case it is well not to lay the weight directly on the skin, but rather to suspend it from the limb or hand in a pocket handkerchief. Again, the muscular sense of the arm may be tested by requiring the patient to touch a prescribed part of the face with a finger, having the eyes shut; or by holding out a watch ticking loudly and requiring him to touch it, the eyes remaining closed.

Although the opinion I have already advanced, *viz.*, that muscular anæsthesia is much more commonly present in organic than in

functional cases, is opposed to the view entertained by Duchenne, yet I must enforce the statement, and affirm most positively that in the large number of hysterical cases which have come under my notice, with but one or two exceptions—and they were doubtful cases—the muscular sense was unimpaired.

Erb asserts that "*anæsthesia of muscular sensibility*" may occur without cutaneous anæsthesia, and also, that it is usually accompanied by muscular paralysis.\*

I can only say that I have never been able to satisfy myself of the existence of muscular anæsthesia without some degree of cutaneous sensory impairment. However, I am at a loss to understand how Erb has come to associate, so frequently, muscular paralysis with muscular anæsthesia, as he himself says, "anæsthesia of the sense of muscular effort is most frequently observed in grey degeneration of the posterior columns of the spinal cord (*tabes dorsalis*);" unless the explanation is to be found in his refinement of distinction between the sense of muscular effort and muscular sensibility.

I have already remarked upon the diminution of muscular sensibility in cases of lead anæsthesia, and adduced an example in illustration.

As is well known, it is in cases of so-called locomotor ataxy that muscular anæsthesia is so often observed; indeed, a considerable number of physicians attempt to explain the characteristic phenomena of *tabes dorsalis* by the impaired muscular sense alone. Without combating such a view, it should be borne in mind that it is not always in cases presenting the most exaggerated muscular insensibility that the most characteristic gait is found, as was well shown in some cases of my own recently published in the *British Medical Journal*.

Impaired muscular sense in locomotor ataxy may be general or limited in its distribution; as a rule, it bears a distinct relation to the cutaneous anæsthesia, fluctuating in a remarkable manner, as does the cutaneous impairment. It happens frequently for example, that a patient who on admission to hospital failed to describe, with his eyes shut, the position of his limbs in bed, will in a few days recognise with almost normal accuracy the slightest alteration in their position. Again, at times patients will stand without much difficulty in the *ataxic position*, whilst on other occasions they fall at once. Of course, in very exaggerated cases the fluctuation is less noticeable; probably this obtains in cases where the internal root zones are markedly changed. It very seldom happens that the electro-muscular sensibility—that which is analogous to the tactile sensibility of the skin—is completely lost, even for any limited area, *i.e.*, a patient who fails to recognise the position of his limbs

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\* Ziemssen's *Cyclopædia of the Practice of Medicine*, English translation, vol. xi., p. 236.



or is utterly unable to stand in the *ataxic position*, will at the same time perceive a dull feeling of contraction, on the application of a Faradic current, though less distinct than in the normal condition, the strongest current failing the while to excite pain. Or in other words, as is the case in the cutaneous sensory impairment, it generally happens that muscular analgesia is much more marked than muscular anæsthesia.

At first it is a difficult matter to explain the disagreement amongst authors as regards the occurrence of anæsthesia, muscular and cutaneous, in cases of *tabes dorsalis*. With Leyden, I am inclined to look upon anæsthesia as a most constant symptom; and can only conclude that the failure on the part of others to recognise this fact is due to the great variability, from time to time, in the degree of sensory impairment, cutaneous and muscular.

Romberg writes:—"I have observed that anæsthesia of the muscles alone, without loss of tactile power, invariably accompanies *tabes dorsalis*."\*

From my own observations, I should, without hesitation, assert that in every case of grey degeneration of the posterior columns, cutaneous anæsthesia is present, more or less, as well as muscular anæsthesia; the latter, owing to the difficulties which beset its investigation, being often overlooked, or perhaps better said, evades discovery. In this opinion I am aware that I am opposed to the views of many authorities. Topinard—quoting from Erb's article on "*Tabes Dorsalis*" in Ziemssen's *Cyclopædia*—in 109 cases found cutaneous anæsthesia 76 times distinctly, 15 times very lightly, and 18 times not at all. In 50 cases observations were made on the muscular sense, out of which number muscular anæsthesia existed 20 times to a high degree, 8 times slightly, and 22 times not at all.

Friedreich also has observed cases of "intense sclerosis" of the posterior columns, without even a trace of anæsthesia, cutaneous or muscular. Erb himself italicizes the following statement:—"There are cases of well-pronounced *tabes* in which every sort of disturbance of cutaneous or muscular sensibility is lacking."

Bristowe writes:—"There is sometimes total abolition of cutaneous sensibility in the feet, and there may be some impairment of it, extending even to the abdomen. Occasionally it is absent."†

Wilks, in his book on "Nervous Diseases," writing on locomotor ataxy, has the following statement:—"Now, as regards *anæsthesia*, I believe I have seen cases where sensation has not been lost, and in others where the sense of feeling has merely been retarded."

\* Romberg on "Diseases of the Nervous System."—Sydenham Society Translation, vol. i., p. 226.

† Theory and Practice of Medicine, p. 971, 3rd edition.

Althaus\* states that "Sensibility always suffers at this stage of the complaint," referring to a period in the history of a case when ataxy has become marked; by which the author means "numbness" in a limb. He adds, however, that this numbness may exist without any loss of cutaneous sensation. A little further on, Althaus remarks that "cutaneous anæsthesia is a frequent, but by no means constant, symptom of ataxy, and generally appears only at a somewhat later period of the disease."

In spite of this formidable array of authorities in opposition to the view I have already advanced, I must again express my firm conviction that anæsthesia—cutaneous and muscular—using the term in its widest sense, is present, in a varying manner, in every case of grey degeneration of the posterior columns; or, to save myself from the charge of dogmatizing, in the spinal affection which is recognised by the following features, viz.: anæsthesia—cutaneous and muscular, inco-ordination—shown by a peculiar gait, lancinating pains, girdle sensation, myosis, ocular pareses, &c., &c. It is generally acknowledged that the muscular sense is frequently more or less impaired in cases of multiple cerebro-spinal sclerosis. The patient is unable to bring together rapidly the tips of the forefingers of both hands whilst the eyes are closed. As in the case of locomotor ataxy, there is at times an inability to describe the position of the limbs, with the eyes diverted from them. However, it is to be noted that in cases of multiple sclerosis, the muscular anæsthesia, or more correctly analgesia, can be discovered, by the careful application of the Faradic current to individual muscles, to be often very limited in its distribution. This anæsthesia, in the affection under consideration, varies very remarkably from time to time; the notes of a case, as regards this point, fail in the space of a few days to describe the condition. Bristowe, it is true, states that in multiple sclerosis "the muscular sense remains unaffected." Erb recognises the fact that impairment of the muscular sense does occur; the fact being that the sclerosed patches, though most frequently found in the antero-lateral columns, do, undoubtedly, invade the central grey matter, as well as the posterior columns, at times.

Passing away from what is avowedly a very difficult subject, viz., the muscular sense and its impairment, we come to consider the cutaneous anæsthesiæ of cord disease. It is a conspicuous fact, one to which I have already alluded, that in disease of the spinal cord, painful impressions are much more frequently lost than are tactile; indeed, the extent of disease in the sensory paths, consistent with the almost normal appreciation of tactile impressions, is very remarkable. In the case of a patient admitted into the Newcastle

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\* Diseases of the Nervous System, p. 316.



Infirmary for *broken neck*, under the care of Dr. Heath, then senior surgeon to the Hospital, by whose kindness I had an opportunity to examine the condition of the patient, there was almost normal tactile sensibility below the seat of injury to the spine; or to be more accurate, touch impressions were but slightly interfered with on the right side, being practically normal on the left, whilst the left side (arm and leg) was affected by motor paralysis. Pins inserted actively into the skin of the right side, below the upper limit of the paralysis, were described as touch sensations only. The patient succumbed a few days after these observations were made, and the *post-mortem* revealed the fact that the cervical cord was markedly compressed by a clot about the size of a cherry, situated outside the membranes on the left side, so that the left side of the cord was distinctly flattened. Unfortunately the cord was not sufficiently well preserved to allow of microscopical sections being made.

Sensory impairment in myelitis of the cord, of course, depends altogether upon the situation of the lesion. In anterior poliomyelitis or infantile paralysis, the inflammation being practically confined to the anterior cornua, no anæsthesia occurs—cutaneous or muscular. The same statement holds good in the case of a lesion in the same situation in adults—a very rare occurrence. Cases do occur, it is true, from time to time, in which a myelitis, caused by cold or injury, seems to be, so to speak, centred round the large cells in the anterior grey cornua, resulting in atrophy of certain groups of muscles with paralysis, and loss of electrical excitability (especially towards the Faradic current) as well as a diminution of reflex activity, so far as these muscles are concerned. In some of these cases I have noticed sensory impairment, with paresis of other muscles, without loss of electrical activity. In spite of the resemblance of a case of this kind to infantile paralysis, I believe the true anterior poliomyelitis in adults to be very rare indeed; by that, I mean a somewhat suddenly developed and circumscribed lesion confined entirely to the anterior large cells. In my experience, a complete sensory paralysis in myelitis very rarely occurs; the fact being that cases of the so-called *acute central myelitis* and *complete transverse myelitis* have not come under my notice. It is not uncommon to meet with the phenomenon of retarded conduction in cases of myelitis. Analgesia is the rule in myelitis when any sensory impairment exists.

Unlike the purely functional cases, *paræsthesiæ* are especially common in inflammation of the cord; indeed it is rare to observe impaired conduction in such cases without the complaint of numbness, “needles and pins,” or other subjective sensations.

In myelitis from slow compression of the cord it rarely happens—especially when the cord lesion is caused by caries of the spine—by

far the most common cause—that there is any marked disturbance of sensibility. As is well known, cases are frequently to be met with in which a high degree of motor paralysis exists, with more or less rigidity, and increased deep reflexes, without any discoverable anæsthesia. This occurs especially in cases in which the bone inflammatory processes are very chronic and unirritative, so much so as to lead to the impression that the paralysis is more the result of pressure exercised by thickened membranes, than of the extension of the inflammation to the cord itself, the latter being undoubtedly the most frequent mode of attack.

In one of my cases of paraplegia from caries resulting in Potts' curvature in the mid-dorsal region, the patient, aged 40, a male, presented a very considerable degree of motor paralysis, with a marked increase in the knee phenomenon, and slight ankle clonus, rigidity of the legs, but without any interference whatsoever in the conduction of sensory impressions. In six months' time this patient had completely recovered, an event which I must confess I had not looked for, as I was inclined to the view that descending sclerosis of the lateral columns had resulted from the compression.

Whilst recognising the important fact that myelitis from slow compression is frequently unattended by anæsthesia, it must not be supposed that such is the invariable rule. In the following typical case anæsthesia appeared late in the history of the attack, but only after the myelitis had extended its ravages to almost the entire thickness of the cord.

Ellen C., aged 23, a dressmaker, came under my care on the 3rd of February, 1880, suffering from paraplegia. For twelve months previously she had complained of pain in the back, "between the shoulders," and for five or six months her legs had been weak. However, a fortnight before I first saw her the paralysis of the lower extremities became much more marked, and it was with the greatest difficulty she could walk.

She was confined to bed, but could move her limbs—raise them from the bed—as she lay. The spinous processes of the 5th and 6th dorsal vertebræ were prominent, marking the site of the caries. A hot sponge passed down the back caused pain at a spot about three inches below the curvature, which corresponded almost exactly with the upper limit of the anæsthesia, as it subsequently appeared.

The legs were somewhat rigid, and felt numb. The plantar reflex on both sides was increased. Ankle clonus and knee phenomenon were very marked. At first sensibility was almost normal; the slightest touch was felt, and accurately referred to the correct situation. In the right leg, however, the prick of a pin inflicted but comparatively little pain. In the case of the left leg sensation was absolutely normal.



In three weeks the motor paralysis had become almost complete, whilst the sensory condition remained almost unchanged.

On March the 10th (five weeks from the time she was first seen) the motor paralysis was complete, and the sensibility of the right leg was very considerably impaired, the left less so. She was now for the first time unable to tell the position of her limbs with the eyes closed.

On the 26th of May, the motor paralysis continuing the same, both legs were found to be almost completely anæsthetic. The case was soon afterwards lost sight of, as the patient was taken to the country.

In primary sclerosis of the lateral columns there is no sensory impairment. Only one example of this rare affection has come under my notice, and though the paralysis and rigidity were considerable, yet no trace of sensory impairment could be discovered. In two or three cases presenting the leading features of *tabes dorsalis spasmodique* of Charcôt or primary lateral sclerosis, the discovery of analgesia aided materially in arriving at the diagnosis of secondary descending degeneration of the direct pyramidal tracts dependent upon myelitis, in lieu of primary sclerosis.

I have already stated my opinion that in every, or nearly every case of *tabes dorsalis*, some degree of sensory impairment can be demonstrated.

The fact also has to be recognised that the degree of inco-ordination bears no relation to the cutaneous anæsthesia. The phenomena in this affection—locomotor ataxy—present great variety. When any dullness of sensibility exists, analgesia, more or less marked, may be demonstrated. This analgesia not uncommonly extends much beyond the ataxic limbs, and before the arms are affected by any motor impairment (inco-ordination), the skin may become analgesic; in a considerable number of my cases the analgesia extended to the entire surface of the body, whilst the apparent gross change in the cord, as shown by the ataxy of the legs, was confined to the lower dorsal and lumbar regions. The higher degrees of cutaneous anæsthesia, such as are found occasionally in hysteria, and also in transverse myelitis, crushing of the cord, &c., are rarely, if ever, observed in true locomotor ataxy (sclerosis of the posterior columns).

Although the most striking phenomenon in *tabes* is a loss of painful impressions, yet it generally happens that touch sensations are not quite fully appreciated, or if the anæsthesia be more marked, the patient fails to distinguish objects with his fingers—a key, &c., whilst he retains the general impression of a *something*. Again, in many cases a strong stimulus is required before the patient can be got to say that he feels at all, as for example, a firm pinch or grasp, a prick with a pin, &c. It must not be forgotten that in

locomotor ataxy there may be, in certain areas, an increase in the sensibility to pain—hyperæsthesia—with a diminished tactile sensibility,

The loss of touch or painful impressions in *tabes dorsalis* is by no means evenly distributed over the surface; it frequently happens that the anæsthetic areas are very limited, so that spots are found almost totally devoid of sensation, bordering on portions of the skin nearly normal; hence, care is required in testing the sensibility of locomotor ataxic patients. It is in these cases that the phenomenon first described by Cruveilhier, of *retarded sensation* is so frequently observed; according to Schiff, this occurs whenever the gray matter of the cord is encroached upon. The retardation is almost invariably noticed in connection with painful sensations, touch being but rarely impeded. I am inclined to think that thermal impressions are more often retarded than has hitherto been supposed. This opinion agrees with a remark of Topinard's. In many cases, I will not say all, it appears to me that this retardation is a mental phenomenon, rather than an actual blocking in the cord during the interval between the moment of application of the stimulus, and the estimation of the same by the patient. In hysterical cases, the analgesia must be in a great measure, if not altogether, a failure on the part of the mind to take cognizance of the impressions which are arriving at the sensorium. The cause of this failure we do not at present understand, but may not the absence of sensation on the moment of application of the point of a pin to the skin of a tabetic patient be due to the fact that the mind, unaccustomed to recognise centripetal impressions, takes a little time to put a correct interpretation upon the telegraphic messages which it is receiving? Just as a person with amblyopia will look at an object for some time before the exact character of the visual impression is recognised; or shall we say, by drawing an illustration from photography, that, as the light is bad, the object has to be exposed for a longer period in order to obtain a clear image? It is evident that this explanation will not do in all cases; however, it will, I imagine, stand in some. Another phenomenon of impaired sensibility often observed in ataxic patients is, the inability to tell correctly the sequence of several pressure sensations rapidly repeated. I agree with Erb in the opinion that this phenomenon is due rather to a persistence of sensation than to a retardation, as some have suggested.

Another manifestation I have frequently met with in ataxic-patients is as follows:—A distinct touch sensation, excited by a stimulus—say the prick of a pin—will disappear suddenly, although the stimulus is kept up or even increased, the sensation being at once renewed when the stimulus is applied to an adjacent spot on the skin, the spot originally stimulated remaining for a short period, as it were, exhausted. This phenomenon is occasionally to



be observed in cases of hysterical anæsthesia, a point to which I have already referred.

According to Topinard, sensibility to thermal stimuli is retained, in many cases of *tabes dorsalis*, an unusually long time. In my experience ataxic patients seem to retain longer the ability to recognize cold impressions than hot ones. A cold body is described correctly, whilst it often happens that a hot body gives rise to a "pricking sensation." On the other hand, a prick of a pin is occasionally described as hot. In a case recorded by Dr. Brakenridge this was a noticeable feature.

The variety in the anæsthetic manifestations of cases of locomotor ataxy is truly inexhaustible, alterations occurring in the phenomena in individual cases from day to day.

It had been my intention to discuss the cutaneous anæsthesia resulting from brain affections in this paper, and to complete it by giving my experience of metallo-therapie in cases of anæsthesia, functional as well as organic, a subject to which I have given some attention; but unfortunately, this communication has already extended beyond the limits usually accorded to such papers, consequently I must take the liberty of pursuing the subject in an additional communication.

















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